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تتقيح REV.	سبب الإصدار ISSUED FOR					بواسطة PREPARED	راجعها CHECKED	وافق عليها APPROVED	التاريخ DATE		
 رقم المشروع PROJECT NO 30403					المملكة العربية السعودية KINGDOM OF SAUDI ARABIA المؤسسة العامة لتحلية المياه المالحة SALINE WATER CONVERSION CORPORATION (SWCC) نظام نقل مياه الجبيل – الرياض Jubail-Riyadh Water Transmission System						
JACOBS ZATE المهندس ENGINEER					Jacobs, Zamel & Turbag Consulting Engineers						
 شركة الراشد للتجارة والمقاولات AL-RASHID TRADING & CONTRACTING CO. المقاول CONTRACTOR					Al-Rashid Trading & Contracting Co.						
					OPERATION AND MAINTENANCE MANUAL FOR AIR VALVES						
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المقاول بالباطن SUBCONTRACTOR					 NENCINI® CUSTOM-MADE WATERWORKS VALVES						

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1GENERAL The present document has the purpose of assisting the personnel in charge of the installation, use, maintenance, and repair of the Nencini Air Valves for the project in subject. It is therefore recommended to read it before performing any work on the valves in the matter. <table><thead><tr><th>NO</th><th>Size mm</th><th>Class ANSI</th><th>Operation</th><th>Weight kg</th><th>Qty</th></tr></thead><tbody><tr><td>1</td><td>150</td><td>150</td><td>AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH ANTI-SLAM</td><td>166</td><td>2</td></tr><tr><td>2</td><td>150</td><td>150</td><td>AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH SURGE PLATE</td><td>154</td><td>4</td></tr><tr><td>3</td><td>150</td><td>300</td><td>AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH ANTI-SLAM</td><td>192</td><td>28</td></tr><tr><td>4</td><td>200</td><td>300</td><td>AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH ANTI-SLAM</td><td>260</td><td>1</td></tr><tr><td>5</td><td>250</td><td>150</td><td>AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH SURGE PLATE</td><td>224</td><td>12</td></tr><tr><td>6</td><td>250</td><td>300</td><td>AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH ANTI-SLAM</td><td>312</td><td>18</td></tr><tr><td>7</td><td>300</td><td>150</td><td>AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH ANTI-SLAM</td><td>409</td><td>8</td></tr><tr><td>8</td><td>300</td><td>150</td><td>AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH SURGE PLATE</td><td>348</td><td>12</td></tr><tr><td>9</td><td>300</td><td>300</td><td>AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH ANTI-SLAM</td><td>468</td><td>46</td></tr></tbody></table> The following reference documents for this project are applicable: 70-RT40-H-303 – “Manufacturer Specification, FAT Procedure, External Coating and Lining Procedure and Materials”; 70-RT40-H-319 – “Technical Details and Data Sheets for Air Valves”; 70-RT40-H-328 – “Inspection Test Plan of Air Valves”										NO	Size mm	Class ANSI	Operation	Weight kg	Qty	1	150	150	AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH ANTI-SLAM	166	2	2	150	150	AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH SURGE PLATE	154	4	3	150	300	AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH ANTI-SLAM	192	28	4	200	300	AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH ANTI-SLAM	260	1	5	250	150	AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH SURGE PLATE	224	12	6	250	300	AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH ANTI-SLAM	312	18	7	300	150	AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH ANTI-SLAM	409	8	8	300	150	AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH SURGE PLATE	348	12	9	300	300	AUTOMATIC AIR RELEASE AND VACUUM VALVE – WITH ANTI-SLAM	468	46
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2 SAFETY INSTRUCTION The following instructions must be added to those general safety regulations for the pipe system in which they are installed. The valves cannot be used for pressures (working and/or transient pressures) and temperatures outside the design range and/or for fluids other than the ones they have initially been designed for. The responsibility of the manufacturer expires in case of: • Not correct installation in the pipe system; • Different flow conditions than the supposed ones on valve design; • Valve operations performed by not competent persons and/or without qualifications for pressure pipes. <u>Warning</u> Before the installing and disassembling of the valve, the main pipe must be completely relieved from the pressure Always contact the manufacturer before performing any disassembly work.									
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3 STORAGE & HANDLING Unless otherwise specified, the standard Nencini packaging is suitable for protecting the valves and their fittings during shipment in closed trucks and/or containers. Furthermore, it fully protects the equipment at the site, when stored in roofed warehouses for short periods of time running from consignment to the putting in commission. Special precautions should be adopted if the valves are to be kept inactive and exposed to atmospheric agents for long periods of time. The valves should not be exposed to direct sunlight or placed close to heat sources and in excessively dry and hot environmental conditions. In case of long warehousing periods, it is recommended to spread the flange seal rings, if any, by a protective product that does not attack the rubber chemically (Vaseline or suitable powders) to prevent cracks and/or breakage due to the “ageing” of the seal. The Valve can be stored Outdoor with waterproof cover; no particular requirements with respect to temperature and humidity. The warehouse type shall prevent foreign matters (as stones, pieces of steel, woods, vegetable, dust accumulation, ...etc.) to go into the valve, because the risk to damage the seal/seat area and get worse the tightness performance of the valve. The valves should be handled with the utmost care; they should be moved using lifting equipment suitable for the weight of the valves and using the special eye-bolts and/or the flange holes.									
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4 INSTALLATION 4.1 Place The valves should be installed in easily accessible places, leaving around them sufficient space for future servicing. For this purpose, it is opportune that the place where the valves will be installed be provided (or reachable) with suitable valve handling or lifting equipment. Be sure to foresee the proper service to disassemble/assemble the valve from pipe. For the lifting operation purpose, take into consideration of the approx. reference weights listed in Chapter 1. 4.2 Tools The following specific tools should be used for the proper install of the flow control valve in their designated location: • A lifting device rated for the weight of the flow control valves as stated in their general assembly drawings (see table in Chapter 1). The lifting device should come with a double leg sling chain as all air valves are equipped with two lifting eyes. The chains should also be rated correctly for the weight of the flow control valves; • A hydraulic torque wrench. The hydraulic torque wrench should be rated for the range of required preloads and bolt sizes to be used for the flanged coupling; • A crowbar, to open the wooden crates; • Open end wrench for general use. 4.3 Preparation for Installation Before starting the assembly, perform the following points: • Check the external packing / protection of all received equipment. In case the packaging / protection is not intact, it could be the reason of some damage • Unpack completely the Valve from its wooden support and protection; • Check that the upstream hub/flange is conform to the drawings; • Check that the full set of bolts and nuts required to couple the valve is available; • Perform a visual inspection inside the valve for the absence of foreign matter; • Check if the floater is free moving. • Check for the good conditions of all flange seals.									
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4.4 Installation 4.4.1 General Consideration All the equipment in matter were tested at the workshop by mean of pressure test, tightness test and functional test on 100% basis. The good/acceptable result of those tests and the good condition of the received packing give You the confidence of the good status of the equipment and the conformity to the Project requirements. Nencini Co. is not responsible for the installation, but we can suggest taking into consideration the following during the assembling operations (if applicable and required). As a general note, we always recommend an upstream on/off valve for future maintenance purpose. 4.4.2 O-Ring assembling (if provided in a coil) a. If the o-ring supplied is in a coil, it is required to be measured and cut to suit each application. Inspect the O ring for any nicks and burrs or cracks and fractures; b. Use a proper jig (available at loctite supplier) to cut and join the O-ring using Loctite 406. This product has rapid cure time (2-10 seconds) follow Loctite manufacturers instruction on the use and care of the product (download MSD Sheet from the website if needed). 4.4.3 Installing the O-Ring a. Use ROLOIL Super lubricant of similar grease and lavishly apply the grease in the flange groove. b. Position the O-ring into groove and ensure it is pressed into the groove properly. This step will ensure the O-ring will stay in the groove and will not dislodge (fall out.) 4.4.4 Assembling units with Bolts and Screws a. Check for any thread damages on bolts; b. Use waterproof graphite grease on the threads (ROLOIL – Isomov MS/2 – , NEVER SEIZE or equivalent) for ease of assembly.									
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4.4.5 Bolts and Screws tightening a. Insert and hand tighten all bolts; b. Use the star pattern for bolt tightening sequence and the table below for torques values. Torque wrench setting values are indicated by International Regulations, but by the following table the typical values are listed (for Bolts 8.8). <table><tr><th>BOLT</th><th>TORQUE (Nm)</th><th>BOLT</th><th>TORQUE (Nm)</th></tr><tr><td>M16</td><td>130</td><td>M27</td><td>620</td></tr><tr><td>M18</td><td>180</td><td>M30</td><td>840</td></tr><tr><td>M20</td><td>250</td><td>M33</td><td>1140</td></tr><tr><td>M24</td><td>420</td><td>M36</td><td>1460</td></tr></table> Should the valve have been kept in the warehouse for a long time and/or there are doubts on the efficiency of the “soft” seal rings, it is advisable to make a preventive replacement according to the indications set on the proper section.										BOLT	TORQUE (Nm)	BOLT	TORQUE (Nm)	M16	130	M27	620	M18	180	M30	840	M20	250	M33	1140	M24	420	M36	1460
BOLT	TORQUE (Nm)	BOLT	TORQUE (Nm)																										
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5ASSEMBLY 5.1Positioning of the Air Valve There are no particular recommendations for the assembling of the Air Valve. 1. Arrange the required flange gasket (or o-ring) and put it on the coupling flange; 2. By the proper lifting devices put in the correct position the Air Valve; the Valve should always be installed in a vertical - upright position; 3. Perform the coupling of the related flanges by their bolts, nuts, and washer. 5.2Warning Sometimes, because the first filling of pipes for the start-up of the plant, foreign matters (as stones, pieces of steel, woods, electrodes for welding, etc.) could remain into the main pipes and carried away by flowing of medium; then they could stop at the Valve seal/seat and damage it. For the above cited it is important, before the filling operation, to clean the upstream pipe and carry out a check to take out any kind of foreign matters.									
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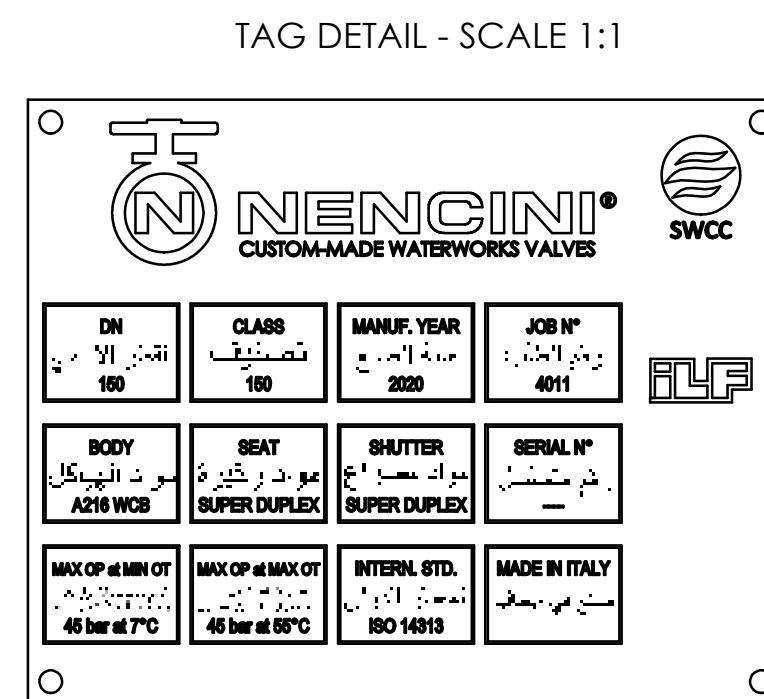
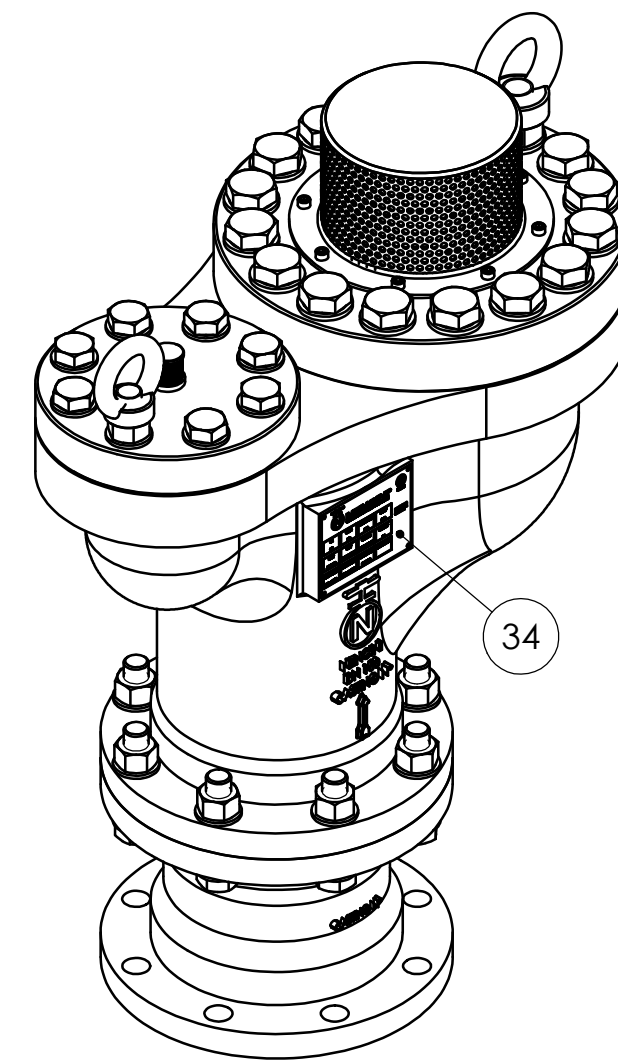
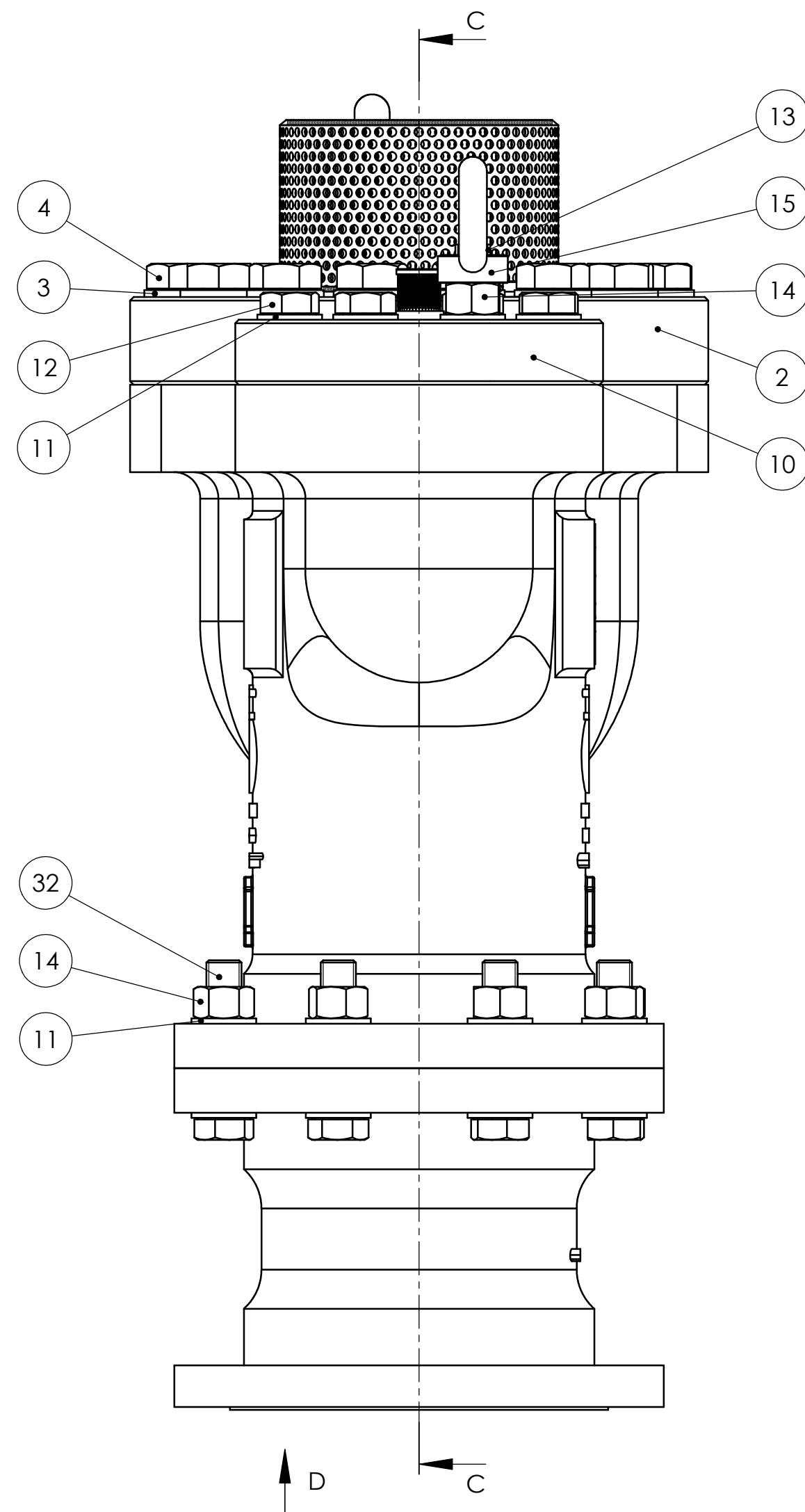
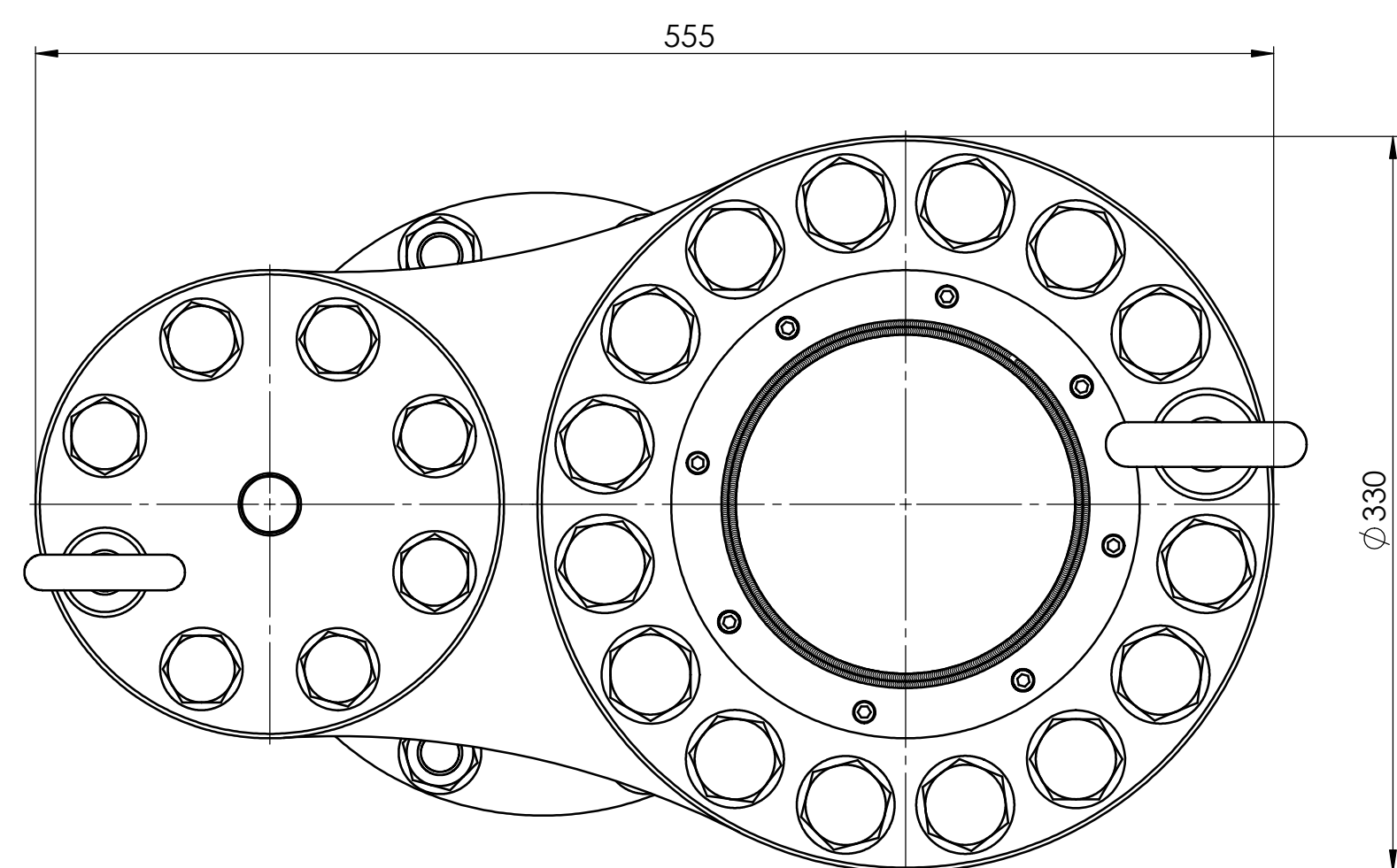
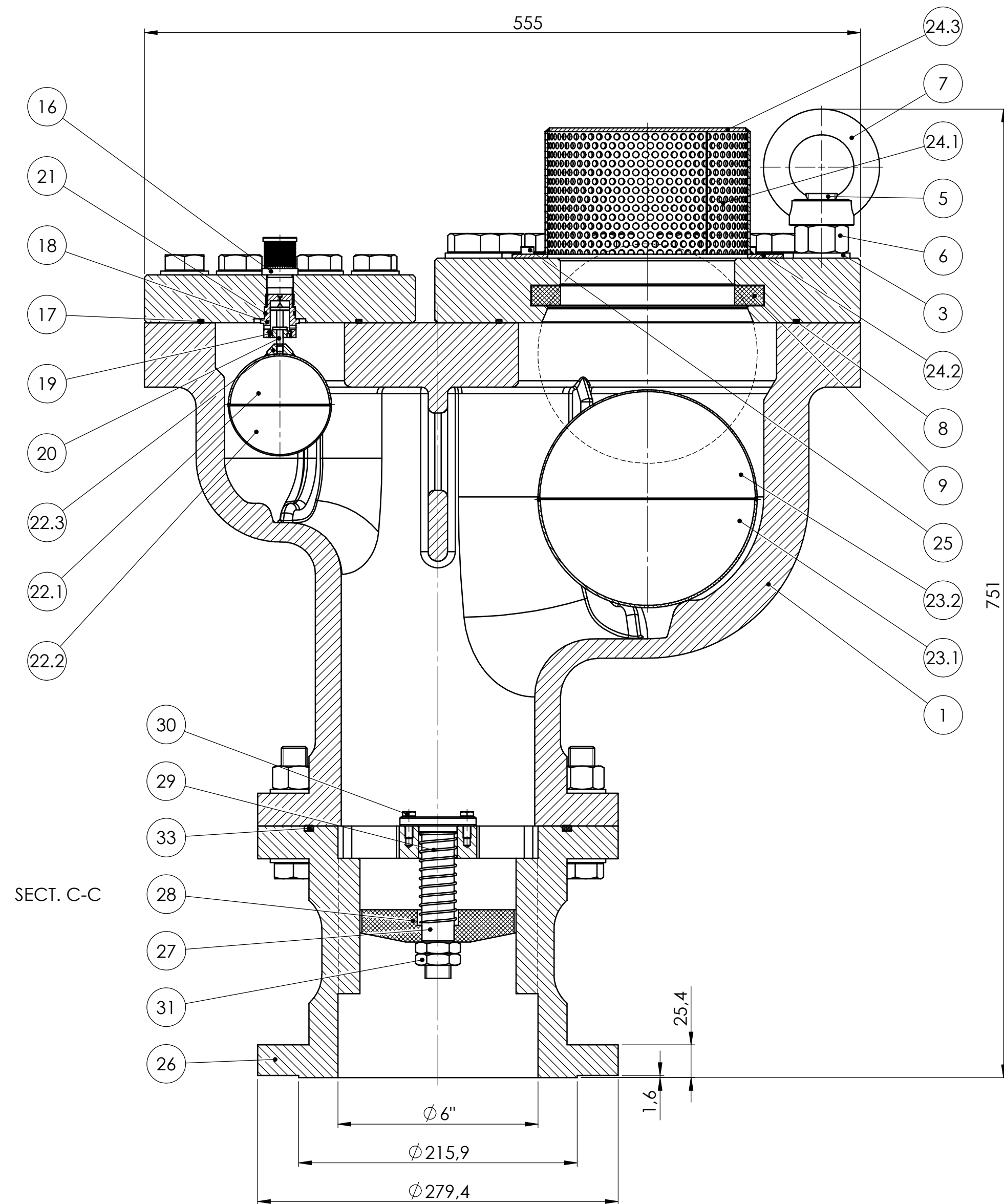
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6 OPERATION Under this section You can check the main rules about the required and suitable operations on the Valves in subject. 6.1 Process Data The valves cannot be used for pressures (working and/or transient pressures) and temperatures outside the design range and/or for fluids other than the ones they have initially been designed for. The design data follows: <table><tr><td>Design Pressure</td><td>20bar for ANSI150; 50bar for ANSI300; 64bar for ANSI400; 100bar for ANSI600</td></tr><tr><td>Medium</td><td>Water</td></tr><tr><td>Design Temperature</td><td>+10°C to +70°C</td></tr></table> 6.2 Valve Technical Description The <u>Combination Air/Vacuum & Release</u> Valve works in the following three different ways: a) allows a large volume of air to escape the main orifice when the transmission system is being filled on start-up and shall close watertight when the water (or any other liquid) enters the valve. During the standard operation, by means of internal pressure, the "main" floater shall remain closed regardless of the water presence in the valve. b) when the transmission system is being drained and/or the pressure value decreases under the room value during the standard operation, the same floater shall open (and surge plate in case present) and admit large volumes of air through the main orifice into the transmission system to avoid vacuum and to prevent column separation. c) when under pressure, during the standard operating condition, the "secondary" floater with pin (by its seat/seal unit) shall release the air which had been dissolved in the water through the pin hole / secondary orifice. The main body of the Valve (i.e., that is flanged to the main pipe) is for purposes a) and b), while the secondary floater (i.e., that is with pin) is for the release purpose (c).										Design Pressure	20bar for ANSI150; 50bar for ANSI300; 64bar for ANSI400; 100bar for ANSI600	Medium	Water	Design Temperature	+10°C to +70°C
Design Pressure	20bar for ANSI150; 50bar for ANSI300; 64bar for ANSI400; 100bar for ANSI600														
Medium	Water														
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Depending on the valve location and specific requirements, the valve could have two different fittings: 1. Anti-Slam device; it is a double flanged unit assembled on the upstream flange of the valve, with the main purpose to avoid the fast filling of the valve body by water and then avoid the quickly closing of the floater against the seat (i.e. avoid the "slam" of the floater) that is dangerous for over-pressure phenomena in the main pipe. 2. Anti-Surge system; it is a spring actuated plate with a specific perforation with the purpose to limit the available outflow of air through the main orifice. It is required in some location according the Project data. Usually the two mentioned fitting are not in the same time assembled on the valve. For a better description of the all Valve components and fittings, see the Valve assembly drawings and its related Components Table.									
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7 MAINTENANCE 7.1 General The Air Valve is automatic in operation and requires little or no maintenance. However, it is recommended to carry out the following inspections and check B) Visual examination for leakage (monthly) Before to carry out the inspection, it is required to dry completely the wetted external surface. The inspection should include a visual examination for leakage at the main flange connections, minor flanges (elbow and secondary body) and on welds. C) Check of Painting (monthly) A visual examination to check damages, if any, on external surface protection (when/where applicable). D) Check of the Valve Tightness (semi-annual) For precaution, we recommended a semi-annual visual inspection for leakage and cleaning of any environmental debris accumulated around/inside the valve. If after the above cited inspections a repair/adjustment is required, refer to the next section.									
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8REPAIR AND ADJUSTMENTS 8.1Welding Repair The main body of the valve is from casting process and then get in touch with Nencini if it is available a rectification by welding. If a welding repair is required, it shall be done conforming the ASME/EN indication and then checked on 100% basis by the following non-destructive examination: - Ultrasonic Test for butt welding - Liquid Penetrant or Magnetic Particles examination for corner welding. 8.2Replacement of the o-ring seals and/or gaskets If a leakage appears from some flange couplings, as first operation You can check the related bolts tightening and try to stop the leakage by a new proper torque on the bolts; refer to the section 4.4.5 for the required value. If You cannot stop the leakage by the above cited operation and the amount of it is not acceptable, the replace of the seal is required (or, as minimum, the check and cleaning operation of it). With reference to the enclosed sketch (See Annex I) you should go on for the following steps: - Shut off the upstream isolation valve when/if it is present; differently never start to remove the bolts completely while the flange coupling is under pressure; - Remove bolts (item 4) and then the Seal Flange (item 2); - Clean the seal area if any foreign matter or dirt is preventing the good work of the seal and replace the main Seal (item 9) if damaged; - Keep out the floater (item 23) and check/clean its surface; - Inspect the inside of the valve body and clean it; - Check the o-ring seal (item 8) and replace it if damaged; - carry out the new assembly by following the instruction of Chapter 4 & 5. Get in touch with Nencini Technical Staff if some clarification is required. (*)_ The enclosed sketch refer to Air Valve DN 150 ANSI 150, but it is obviously valid for different size/rating, too 8.3Painting repair Before of all, oil and grease shall be removed; then You can start with the mechanical cleaning and use again proper clean fluids to avoid leaving a film of greasy residue on the surface. Touch-ups and repainting, where necessary and possible, are to made in compliance with the related painting cycle, product forms and paint manufacturer's instruction.									
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ANNEX I – DRAWING AIR COMBINATION + ANTI SLAM – DN150 ANSI150								
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- PAINTING APPLICATION -	
INTERNAL SURFACES	- Sandblasting gr. SA 2 ½ - Epoxy Fusion Bonded application (certified for potable water) - Total dry film thickness 350µm - RAL 5015 (BLUE)
EXTERNAL SURFACES	- Sandblasting gr. SA 2 ½ - N 1 coat of Zinc-Epoxy Primer with a DFT of 80 µm - N 2 coats of Epoxy High Solid Paint - Total dry film thickness 220 µm - RAL 7032 (GREY)
INOX / BRONZE COMPONENTS	- N. A.

- FINAL WORKSHOP TEST -	
BODY PRESSURE TEST	29.1bar for 10minutes
SEAL PRESSURE TEST	19.4bar for 10minutes

- CONSIDERED SPARE PARTS -	
The q.ty of spare parts mentioned in the S.P. column is in the Nencini scope of supply and is related to the total set of same identical valves	

Required Quantity = 2	Approximated Weight = 166Kg $\pm$ 10%
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34	TG16C-4011A	Identification Tag	Stainless Steel	1	
33	OR8775B	AS-568 A - OR 6775	NBR SH70 Potable Water Certified	1	1
32	A0120X090A2B	Bolt ISO 4014 - M20x90	Ci. 8.8 Hot Dip Galvanized	8	1
31	B0320D1Z	Nut ISO 4035 - M20	Super Duplex UNS S32750	2	1
30	A0206X016D1Z	Bolt ISO 4017 - M6x16	Super Duplex UNS S32750	2	1
29	AS020A3HAA0A001-4011	Spring	Inconel X750	1	
28	AS015A3FAOB03001-4011	Shutter	Nylatron LFG Potable Water Certified	1	
27	AS020A3HAA0A0201-4011	Pin	Super Duplex UNS S32750	1	
26	AS015A3CAOA00101-V02	Body	ASTM A216 WCB	1	
25	A0506X010C1Z	Bolt ISO 4762 - M6x10	Ci. A4 gr. 70	8	1
24.3	CO150C103-4011	Cover - Disc	X5CrNiMoF17-12-2 EN 10088 (AISI 316)	1	
24.2	CO150C102-4011	Cover - Flange	X5CrNiMoF17-12-2 EN 10088 (AISI 316)	1	
24.1	CO150C101-4011	Cover - Filter	AISI 316	1	
24	CO150C100-4011	Cover		1	
23.2	SF170A202-4011	Floater - Hemisphere	Super Duplex UNS S32750	1	
23.1	SF170A201-4011	Floater - Hemisphere	Super Duplex UNS S32750	1	
23	SF170A200-4011	Floater		1	
22.3	SF080A203-4011	Floater - Pin Connection	Super Duplex UNS S32750	1	
22.2	SF080A202-4011	Floater - Hemisphere	Super Duplex UNS S32750	1	
22.1	SF080A201-4011	Floater - Hemisphere	Super Duplex UNS S32750	1	
22	SF080A200-4011	Floater		1	
21	OR2081B	AS-568 A - OR 2081	NBR SH70 Potable Water Certified	1	1
20	SP01A203-4011	Pin	Super Duplex UNS S32750	1	
19	SP01A202-4011	Pin Guide	Super Duplex UNS S32750	1	
18	SP01A201-4011	Pin Seat	Super Duplex UNS S32750	1	
17	OR4475B-4011	AS-568 A - OR 4475	NBR SH70 Potable Water Certified	1	1
16	F1021C	Filter - 1/2"G	Stainless Steel	1	
15	CO220F3A	Lifting Eye DIN 582 - M20	Ci. 4A Galvanized	1	1
14	B0120A2B	Nut ISO 4032 - M20	Ci. 8 Hot Dip Galvanized	9	1
13	A0320X0105B1B	Stud Bolt - M20x105	ASTM A 193 Gr. B7 Hot Dip Galvanized	1	1
12	A0220X060A2B	Bolt ISO 4017 - M20x60	Ci. 8.8 Hot Dip Galvanized	7	1
11	D0120F2A	Washer ISO 7089 - M20	Ci. 100HV Galvanized	24	1
10	AV008A6CAA0A0301-V02	Pin Flange	S355J0 EN 10025	1	
9	OP135X180X15F	Gasket - 135x180x15	EPDM SH85	1	1
8	OR4900B	AS-568 A - OR 4900	NBR SH70 Potable Water Certified	1	1
7	CO224F3A	Lifting Eye DIN 582 - M24	Ci. 4A Galvanized	1	1
6	B0124A2B	Nut ISO 4032 - M24	Ci. 8 Hot Dip Galvanized	1	1
5	A0324X0130B1B	Stud Bolt - M24x130	ASTM A 193 Gr. B7 Hot Dip Galvanized	1	1
4	A0224X080A2B	Bolt ISO 4017 - M24x80	Ci. 8.8 Hot Dip Galvanized	15	1
3	D0124FV	Washer ISO 7089 - M24	Ci. 100HV Galvanized	16	1
2	AV015A6CAA0A0201-V02	Seal Flange	S355J0 EN 10025	1	
1	AV015A3CAOA00101-V02	Body	ASTM A216 WCB	1	
Item	Codex	Article	Material	Qty.	S.P.